

# Historical Context

## Arboreta & Botanical Gardens in the West

“Nothing in biology [botany] makes  
sense except in the light of evolution”

Theodosius Dobzhansky

“Fifty percent of Americans do not  
believe in evolution.”

Recent New York Times poll

Andropogon Associates<sup>Ltd</sup>



Source: *National Geographic*, March, 2001

# Meaningful purpose

## Arboreta & Botanical Garden Expertise

- Expertise in genetics, systematic botany, horticulture and ecology
- Expertise in identifying, collecting, cataloguing, breeding, growing and caring for plants
- Owning and managing large landholdings
- Partnerships with other botanical institutions
- Ties with “green industry”
- Accessible to and responsible to the general public
- Large social purposes
- Stable long-term institutions



Source : Unknown

# Historical Context

## Western Beginnings Monastic Herb Gardens

One of the most important herbals of post-classical times was the medieval herbal “Circa Instans” compiled in 1140 by Mathaeus Platearius. It includes descriptions of hundreds of plant-derived drugs and instructions for their preparation and use.

This herbal reduced the excessive number of common names of plants to a few codified groups and provided precise descriptions of the plants themselves. “Circa Instans” broke the reliance on Dioscorides’ “De Materia Medica” and Pliny’s “Historia Naturalis” both written in first century AD.



Source: [The New York Botanical Garden, An Illustrated Chronicle of Plants & People](#), Ogden Tanner & Adele Auchincloss: Walker Publishing Co., 1991.

# Historical Context

## Western Beginnings

Marco Polo arriving in the Moslem city of Hormuz, in the Persian Gulf, in 1272

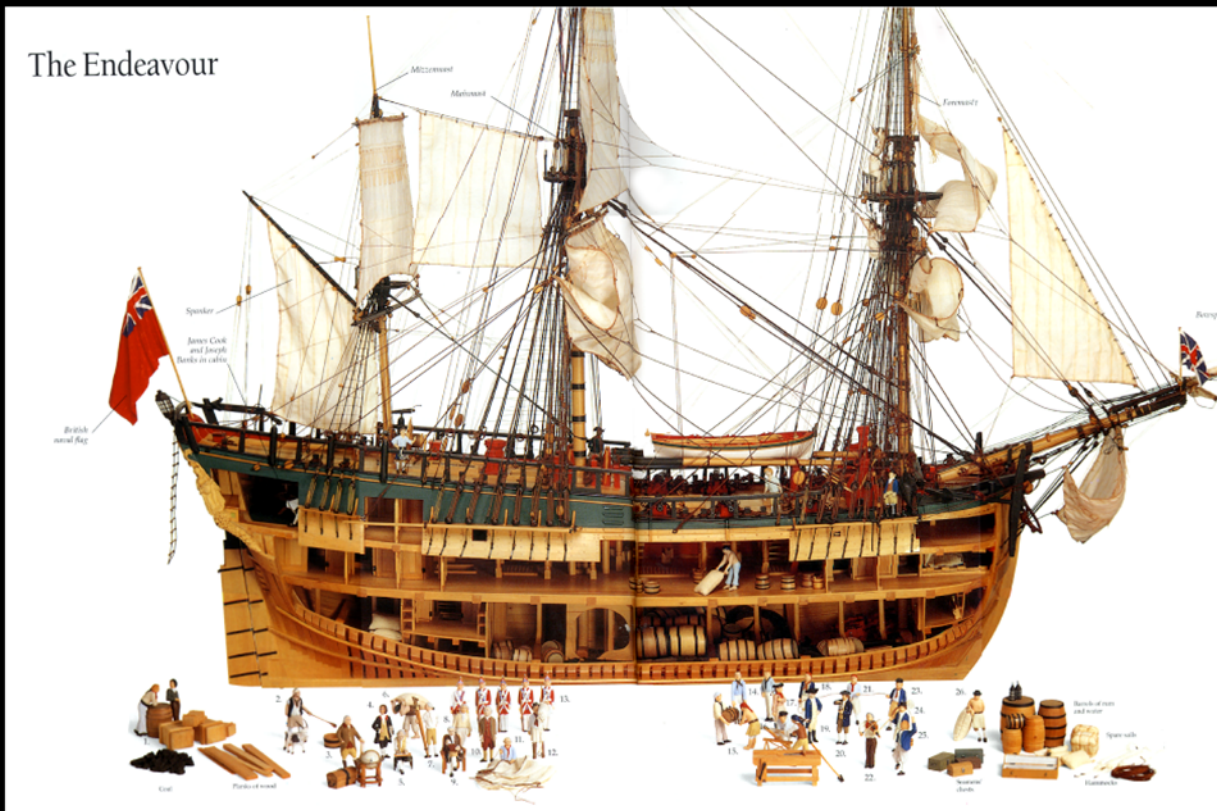


Europeans such as Marco Polo traveled to China along the Silk Road to Asia. It took years and required braving bandits, disease, and deserts.

Source: Explorer, Dorling Kindersley: Eyewitness, 1991.

# Historical Context

## The 17th and 18th Centuries Discovering and Describing the Richness of the World



Source: Explorer, Dorling Kindersley: Eyewitness, 1991.

This was the heyday of the great voyages of discovery. James Cook, captains the “Endeavour” across the Pacific Ocean, with botanist Dr. Daniel Carl Solander, collecting nearly 1000 species previously unknown in Europe.

# Historical Context

## The 17th and 18th Centuries Economic Botany— Instruments of Imperial Endeavor

A primary focus of these 17th and 18th century arboreta/botanical gardens was economic botany—collections of plants of economic importance to the nation. Breadfruit was collected by Captain Bly aboard HMS Bounty, to feed slaves in the Caribbean. Rubber was collected from the Amazon and brought to The Federated Malayan States, to establish rubber plantations, creating the rubber industry.

Breadfruit tree grows wild in Polynesia and is shown here with fruits and native pounder

Source: Explorer, Dorling Kindersley: Eyewitness, 1991.

Andropogon Associates<sup>ltd</sup>



# Historical Context

## The 17th and 18th Centuries Discovering and Describing the Richness of the World

In 1729 John Bartram planted a botanical garden in Philadelphia as a special horticultural nursery supplying North American plants and seeds to customers in Europe and eventually european plants and seeds to colonials.

Botanical drawing of *Franklinia alatamaha*, a flowering understory tree extinct in the wild



Source: *National Geographic*, March, 2001.

# Historical Context

With his son William, John Bartram traveled in northeastern and southeastern North America, collecting plants.



Venturing beyond the bounds of British settlement, Bartram spent nearly four years searching out unusual plants

Source: *National Geographic*, March, 2001.

Andropogon Associates <sup>Ltd</sup>



Bartram's botanical garden, 1758, in Philadelphia, PA

# Historical Context

## The 17th and 18th Centuries Discovering and Describing the Richness of the World

The 17th and 18th centuries were the heyday of descriptive botany. The great herbariums and botanical drawings of plants as well as floristic studies were the tools in the great enterprise of describing plants.

*Laurus folio longiore, flore hexapetalo  
racemoso fructu humido, now known as  
Nectandra antillana, discovered in 1689 by  
Sir Hans Sloane*

Source: The New York Botanical Garden, An Illustrated  
Chronicle of Plants & People, Ogden Tanner & Adele  
Auchincloss: Walker Publishing Co., 1991.

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# Historical Context

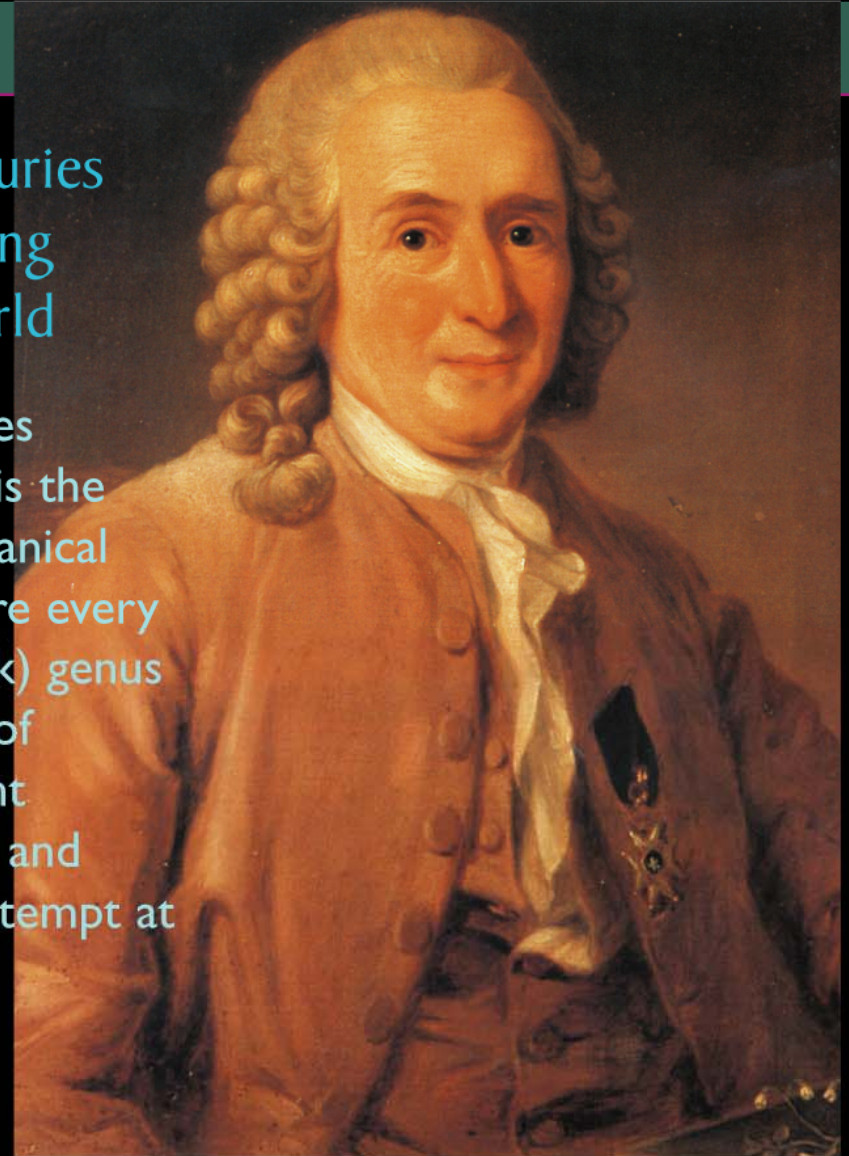
## The 17th and 18th Centuries Discovering & Describing the Richness of the World

In 1753 Carl Linnaeus publishes Species Plantarum. This work is the starting point for modern botanical binomial nomenclature—where every plant received a latin (or greek) genus and species name. The work of Linnaeus converted the ancient herbals into the modern flora and provided the first workable attempt at plant classification.

*Linnaea borealis*, adopted by  
Linnaeus as his emblem

Source: *Country Life, Gardens Issue*, 2002.

Andropogon Associates<sup>Ltd</sup>



Portrait of Carl Linnaeus in his late sixties,  
by A. Roslin, 1775

# Historical Context

## The 17th and 18th Centuries

### Discovering and Describing the Richness of the World



Gardens such as the Royal Botanic Gardens at Kew in London, England, (1760) and the Royal Botanic Garden in Paris, France, were established to display this cornucopia.

Views of the Palm House,  
The Royal Botanic Gardens Kew.



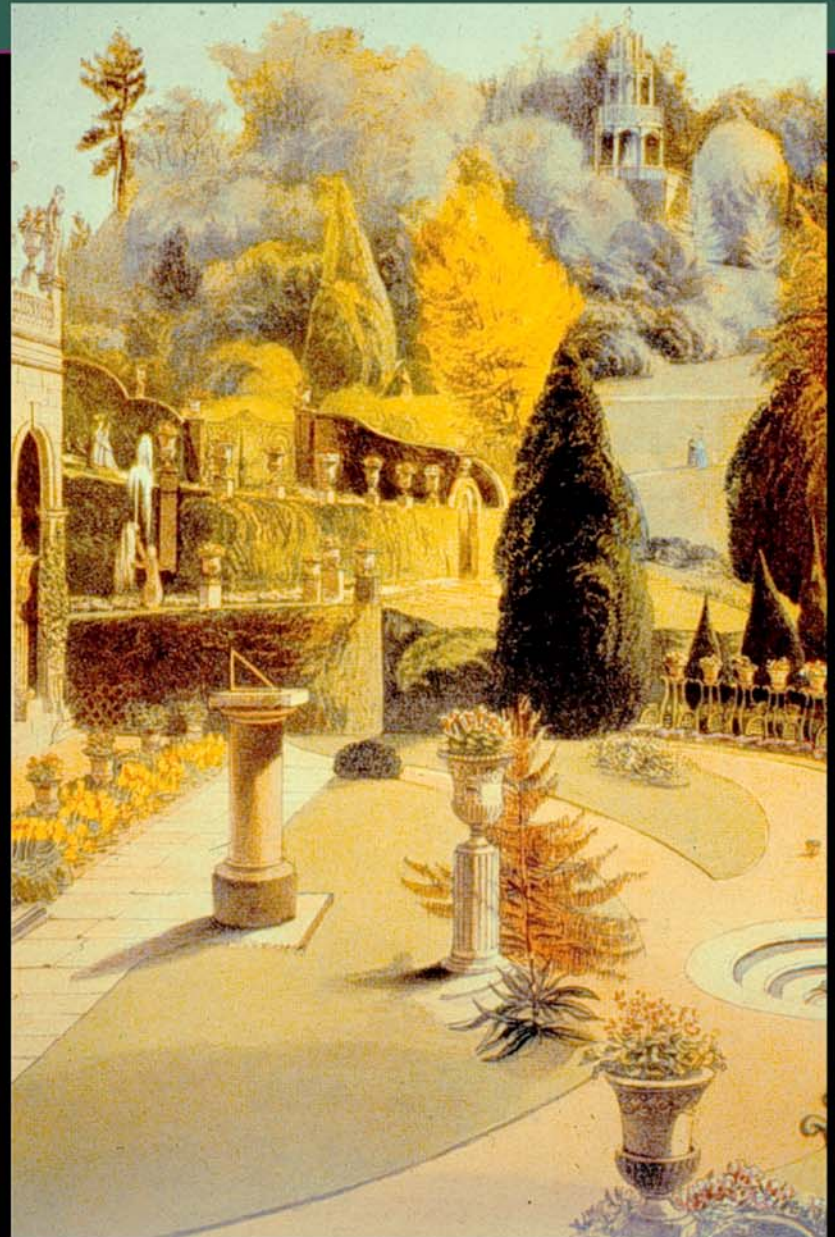
Source: Royal Botanic Gardens Kew, A Souvenir Guide, 2001.

# Historical Context

## The 17th and 18th Centuries Discovering and Describing the Richness of the World

From the mid-17th century on, rich landowners in England and Western Europe planted their estates with exotic species from around the world. Plant collections on these estates reflected the latest voyages. This trend continued well into the 20th century and these properties often became the nucleus of a public horticultural institution.

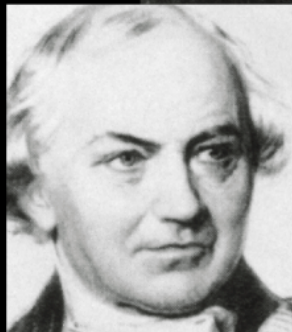
Mid-19th century painting of Honeywell Garden,  
Wellesley, Massachusetts



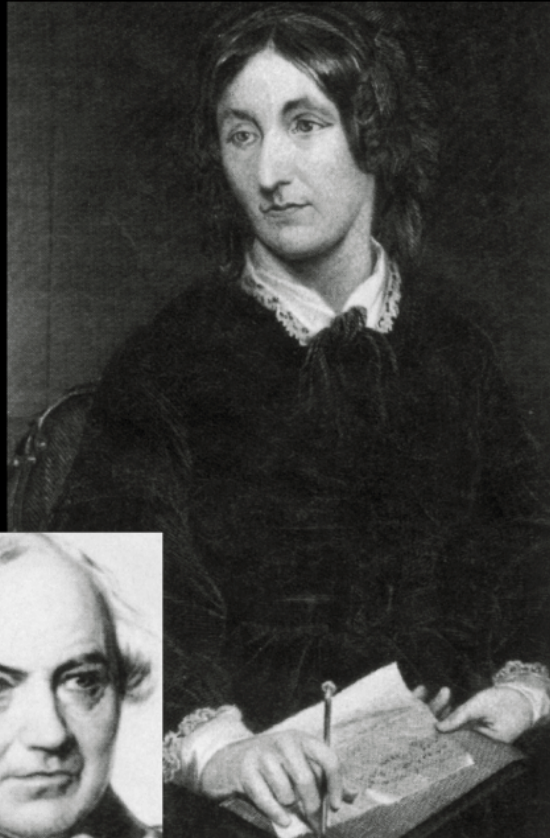
Source: Unknown.

# The Professionalization of Science and the Creation of a Scientific “Elite”

- Large numbers of scientific societies were formed, such as The Royal Horticulture Society established in England in 1804.
- In 1831-33 in speeches at meetings of the British Association for the Advancement of Science, William Whewell, inspired by Mary Sommerville, coined the word ‘scientist’— “that by analogy with artist they might form scientist”.



Source: *Nature*.

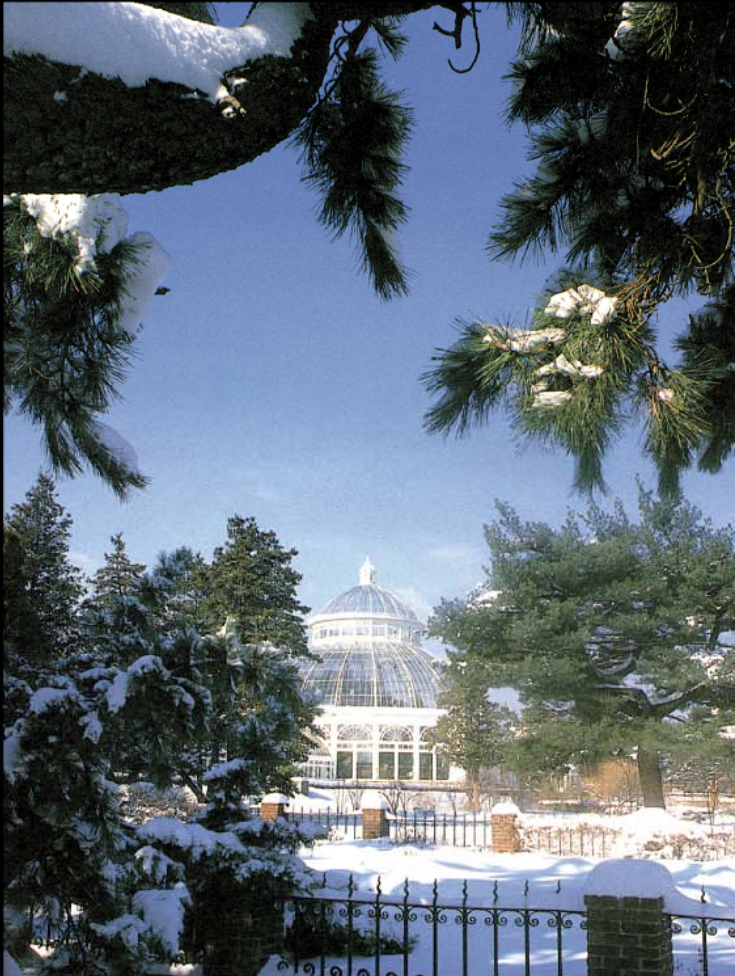


Mary Sommerville and William Whewell

During the 19th century increasingly specialized interests were supported by an increasingly complex technology.

With this increasing complexity of science, scientific institutions became largely the province of the wealthy and well-educated.

# Establishment of Great Public Botanical Institutions 19th century



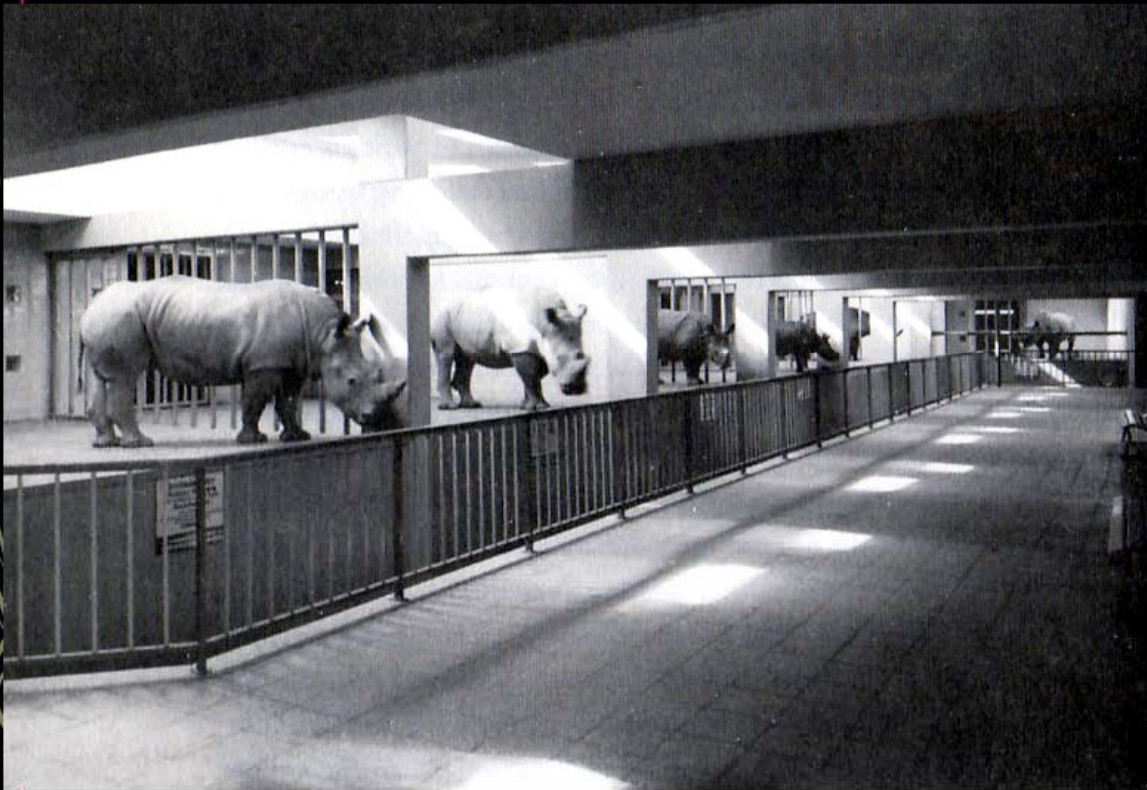
With the scientific and industrial revolutions of the 19th century came democratization, growth of the cities, and a sense of civic pride. In response, the Victorian era saw the creation and flowering of great public institutions—museums, zoos, and arboreta—in England, Western Europe, and every major city in the United States.

- 1860—Missouri Botanical Garden in St. Louis
- 1872—Arnold Arboretum in Boston
- 1888—New York Botanical Garden in NYC

New York Botanical Garden, view in the snow of the Enid Haupt Conservatory

Source: The New York Botanical Garden, An Illustrated Chronicle of Plants & People, Ogden Tanner & Adele Auchincloss: Walker Publishing Co., 1991.

# Collections of Plants and Animals 19th century



Display of the family Rhinocerotidae in the order Perissodactyla, Berlin Zoo, 1960

The tradition of display plants and animals in taxonomic groups was first introduced in the Jardin des Plantes in Paris, France in the 18th century and in the London Zoo, London England in the early 19th century. It has been extremely persistent, appealing to scientific logic and a sense of catalogued order. Curators have now realized that many of these displays are boring and meaningless to visitors.

Source: [A Different Nature](#), David Hancocks,  
University of California Press, Berkeley, CA, 2001

# Natural Selection 1858

A recognition of the incredible diversity of life encountered in the tropics and a desire to explain the elegant adaptations of species to different environments led two naturalist explorers— Alfred Wallace and Charles Darwin—to a theory of evolution.

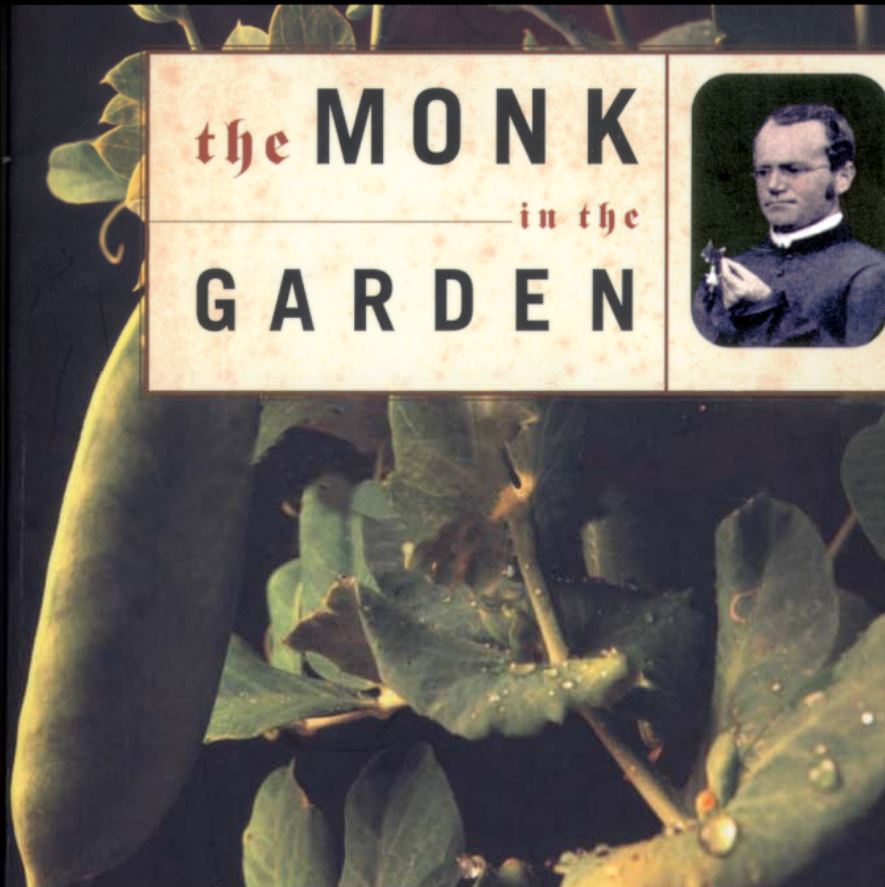
Wallace's paper and a summary of Darwin's findings were presented to the Linnean Society in London, England in 1858. Darwin published On the Origin of Species, in 1859.

In 1831-36 the 22 year old Darwin was the naturalist on the HMS Beagle, captained by Robert Fitzroy. The purpose of the 5 year voyage was to explore the South Atlantic and South Pacific Oceans.



Source: Explorer, Dorling Kindersley: Eyewitness, 1991.

# Principles of Heredity 1866



Source: Book cover, *The Monk in the Garden*, Robin Marantz Henig, Houghton Mifflin, 2001.

In 1865, in a two-part lecture to a local scientific society, an obscure Augustinian monk in Brunn, Moravia, described the elegant botanical experiments he had conducted in a monastery garden.

From those experiments Gregor Mendel established the basic laws of inheritance—that traits pass from parents to offspring as discrete individual units in a consistent predictable and mathematically precise manner. These laws became the underpinning of the new science of genetics.

# Genetics 1900



Sketch of William Bateson in his laboratory,  
c. 1920.

Source: John Innes Center, Norwich, England.

In 1900 William Bateson, an English Biologist brought Gregor Mendel's work to the attention of the scientific world. He also coined the word "genetics" from the Greek "genetikos" meaning origin or fertile.

Bateson also invented the word "zygote," "homozygote," "heterozygote," alleliomorph," and created a new shorthand to express Mendel's generations.

His efforts to create a universal terminology was the first step in turning genetics into a coherent discipline.

# Economic Botany (again) Early 20th century

In the early 20th century interest in collecting medicinal plants, once a primary focus of the monastic garden, moved to the big pharmaceutical companies. Later, arboreta and botanical gardens ally with these companies, to pursue plants for profit in a “drug prospecting” partnership.

In 1938 Richard Gill, an American business man and amateur plant hunter, returned from an expedition to Ecuador with 26 different kinds of vines used in making curare. Gill sold his bulk samples to E.R. Squibb and Sons.



Source: The New York Botanical Garden, An Illustrated Chronicle of Plants & People, Ogden Tanner & Adele Auchincloss: Walker Publishing Co., 1991.

# “Land Grant” Colleges

In an increasingly specialized world, the pursuit of “economic botany” moved to agricultural colleges whose tools were laboratories, experimental plots, and research stations.

These specialized facilities were developed to study ways to improve plant production, control insect and disease problems, and develop new varieties of agriculturally useful plants.

Lupine experiments in greenhouse at Texas A&M  
Coit Road Research Station



# Ornamental Plants and Gardens for the Middle Class 1920s



House and Garden Magazine was first circulated in the 1920s, becoming a major source of information on plants and the design of gardens for a growing audience, particularly of women.

Source: *House & Garden*, 1921.

After WW I, social changes such as a growing prosperity and a widening middle class accelerated interest in gardens and gardening.

The focus of taxonomic collections at botanical gardens and arboreta shifted to "ornamental" plants which would excite and interest the home-owner. The nursery industry burgeoned and new and stronger relationships were created between arboreta and botanical gardens and the commercial production of ornamental plants.

# A Love Affair with Plant Breeding 1920s-1950s



Research at horticultural institutions and at agricultural universities was largely directed to the development of varieties of a very few popular individual species such as rhododendrons and roses.

The David Leach Rhododendron Garden  
at Holden Arboretum, Kirkland, Ohio

# A Love Affair with Plant Breeding

## 1920s-1950s



As values changed and new arboreta were created, many horticultural institutions, especially the newer ones, lost a strong sense of why they were collecting at all, and fell prey to pressures from individual donors, plant breeders, and the nursery trade to shape their collections to personal agendas.

Dwarf Conifer Collection at  
Frelinghausen Arboretum.

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# New Tools Extend the World

## 1960s, 1970s



Auguste Piccard and his son Jacques designed this bathyscaph, called Trieste, to work deep under water. In 1960, the Piccardes took it down 7 miles into the sea.

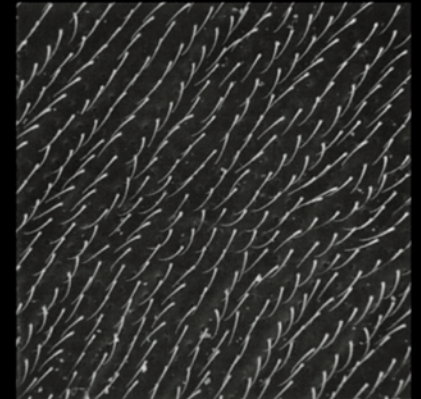
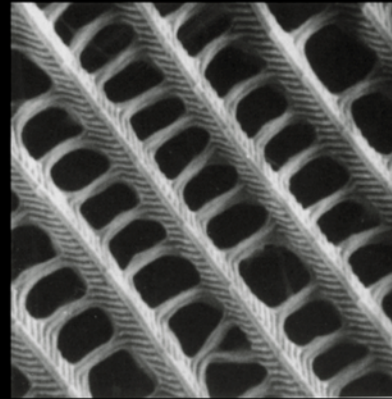
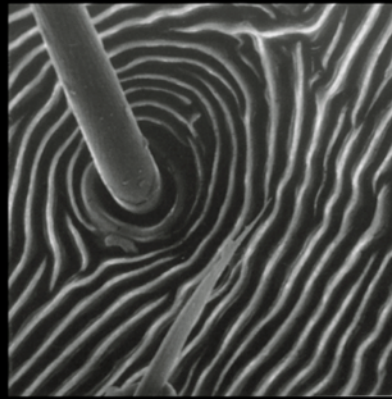
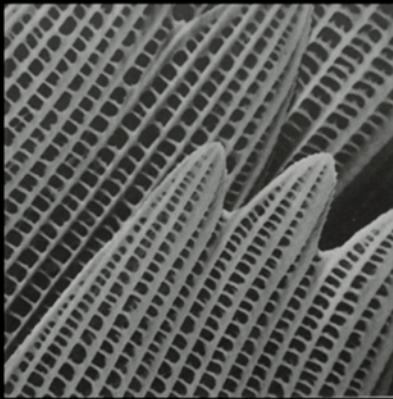


Skylab, the first orbiting science laboratory was launched by the United States in 1973. It contained a vast array of scientific equipment to study the earth.

Source: Explorer, Dorling Kindersley: Eyewitness, 1991.

# New Tools Extend the World

## 1960s, 1970s



Modern scientific photographers capture microscopic detail that naturalists and artists of previous centuries could not have imagined

Source: *Scientific American*.

New discoveries would not have been possible without new tools, such as the electron microscope, and new techniques to manipulate plants, such as gene mapping and gene splicing.

# Structure of DNA 1953

By the 1940s scientists knew that the meaningful information of the genes was packed into a molecule called DNA.

In 1953, at Cambridge University, England, James Watson and Francis Crick created a physical model of the structure of this DNA and interpreted the code through which it talks to the cell.



Source: The Double Helix, J.D. Watson: Atheneum, NY, 1968.

“In this paper we shall describe a structure for DNA which suggests a mechanism for its self-duplication and allows us to propose for the first time a detailed hypothesis on the atomic level for the self-replication of genetic material.”

J. D. Watson and F. H. C. Crick,  
The Structure of DNA, Cold  
Spring Harbor Symposia on  
Quantitative Biology XVIII,  
1953.

# Gene Manipulation and the Creation of New Plants 1990s

A

Creating Genetically Modified Plants



B

Transferring Plants from Petri Dish to Soil



D

Gene Expressed in Plant



C

Growing & Testing These Plants



Source: John Inness Center, Norwich, England

# Continental Drift 1960s

In 1915 Alfred Wegner  
Published the theory  
of continental drift, which  
Suggested that over time  
Continents moved.  
This idea finally gained  
Acceptance in the 1960s.  
The theory explained how  
a diversity of life colonized  
the various land masses

New York Times  
June 26, 2007

Andropogon Associates<sup>Ltd</sup>

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

# An Ecological Sensibility 1960s



Source: Book cover, The Green Revolution, Kirkpatrick Sale: Hill & Wang, 1993.

With the view of the earth from the moon and literature such as Marine biologist's Rachel Carson's Silent Spring (a wake-up call to the public on the hazardous consequences of excessive pesticide use) recognition of the fragility of the Earth became part of the popular imagination.

Earth Day, 1990

Andropogon Associates<sup>Ltd</sup>

# Extinctions 1980

Luis Alvarez, a physicist and his son, a geologist suggest that an asteroid hit the earth 65 million years ago causing mass extinctions

New York Times  
June 26, 2007

Images Blast from the Past  
Smithsonian Museum of  
Natural History

Andropogon Associates<sup>Ltd</sup>

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# Impacts on Natural Systems

Forty years after the beginning of the Environmental Movement, there is a recognition of the stress, fragility and crisis in the biosphere. New impacts have accelerated losses exponentially.

## Global/National

- human population explosion
- global climate change
- acid rain & soil nitrification
- isolation & fragmentation of natural systems

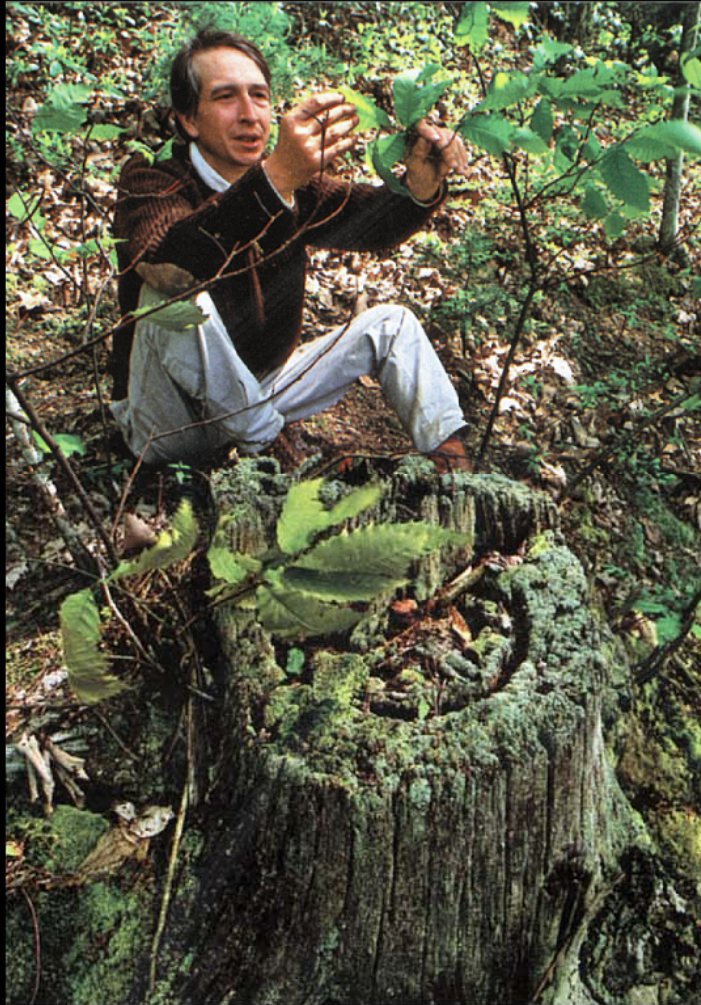
## Local/Neighborhood

- sterilization of land and increased impervious surface
- stormwater mismanagement
- widespread terraforming/ cutting & filling
- vandalism
- trash & dumping
- inappropriate access/creation of rogue trails

## Regional/City-Wide

- invasive exotic takeover
- unchecked expansion of some native species
- pests & diseases
- new forms of recreation
- increasing costs of man power & maintenance
- a love affair with the lawn & “ornamental” plant species

# Blights and Pests 1900s-Present



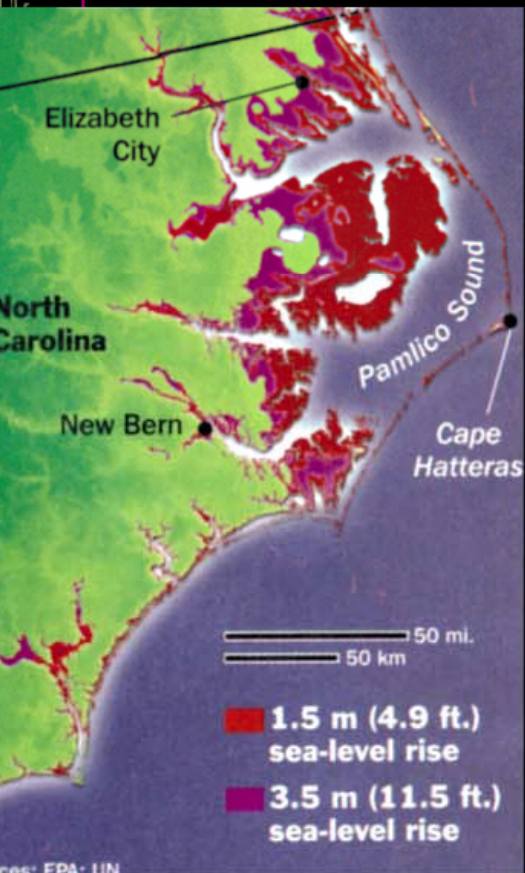
Source: National Geographic.

## Decline of the Native

In 1904 the chestnut blight, a fungus disease, was discovered on imported Chinese chestnut nursery stock, before the enactment of plant quarantine laws. These trees had infected American chestnut trees at the Bronx Zoo in New York City. Within fifty years this blight changed the forest landscape of eastern United States. It appeared that the United States had lost one of its most beautiful and ecologically and economically important trees.

Fred Hebard, Superintendant of the American Chestnut Foundation Farm examines Chestnut sprouts growing from a mature stump

# Global Climate Change 1990s



“Rising sea level—Cape Hatteras, NC. The lighthouse was 1,500 feet from the North Carolina shoreline when it was built in 1870. By the late 1980s the ocean had crept to within 160 feet and the lighthouse had to be moved to avoid collapse.”

Source: *Time*, April 9, 2001.



# Global Climate Change 1990s



Source: Plant, Dorling Kindersley: Eyewitness, 1991.



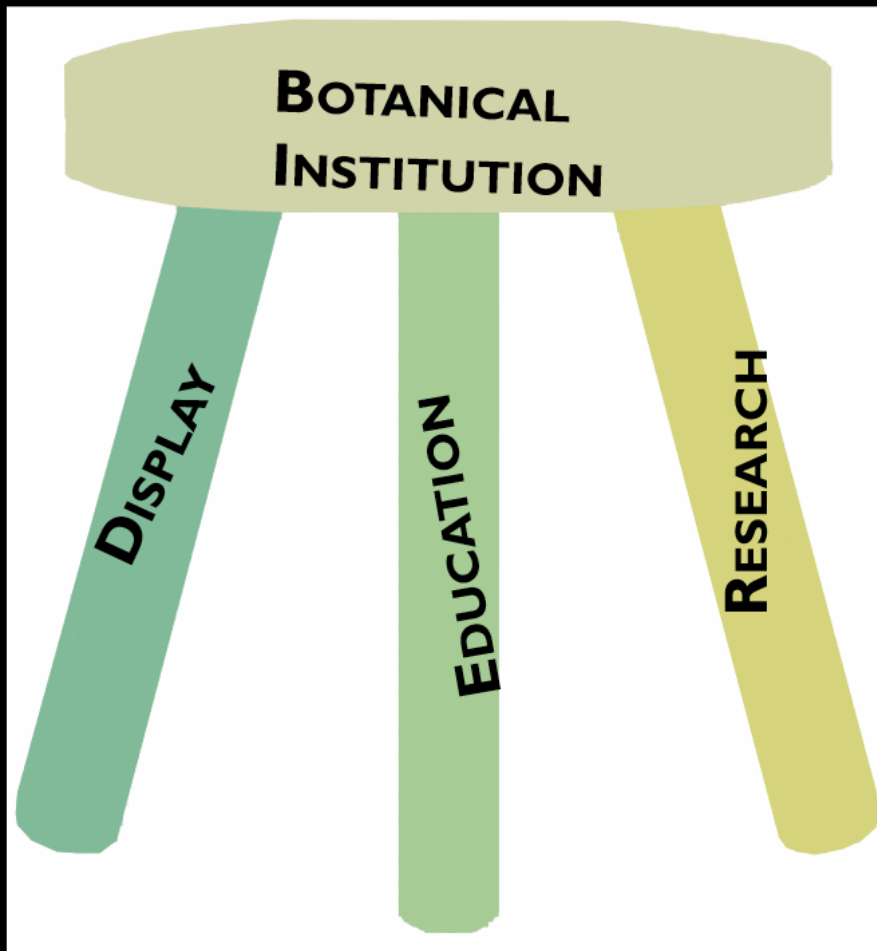
## Beech tree migration in North America

Even slight climate changes can disrupt delicate plant-animal interactions such as pollination and seed dispersal. It can also effect geographic range and studies indicate there is already a northward movement of species range boundaries.

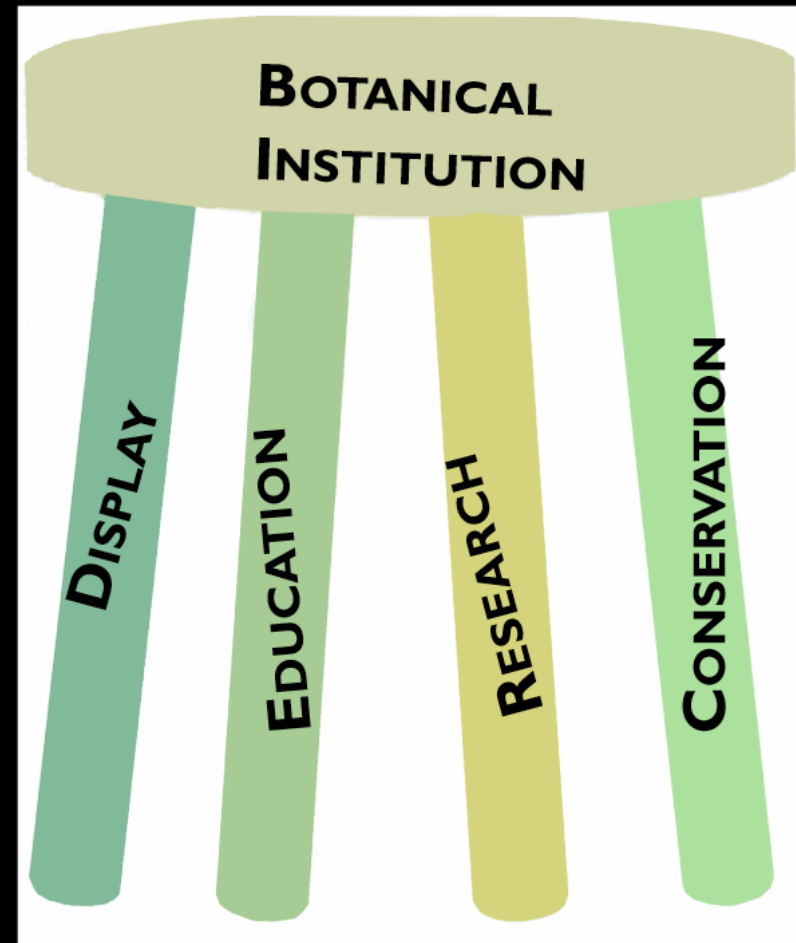
Source: Sierra Club Magazine.

# New Trends

## A Three-Legged Stool



## A Four-Legged Stool





# New Trends

## Partnerships, Consortiums & Cooperation

Steps taken recently to create networks of horticultural institutions:

- 1940 — The American Association of Botanic gardens and Arboreta founded (AABGA)
- 1984 — Center for Plant Conservation founded (CPC)
- 1985 — Grand Canaria Declaration
- 1983 — American Chestnut Society founded by Dr Charles Burnham, Dr. Peter Raven, Phillip Rutter, Dr. Norman Borlaug
- 1987 — The Botanic Gardens Conservation International is founded (BGCI)
- 1989 — The Botanic Gardens Conservation Strategy
- 1996 — Chicago Wilderness formed as a coalition of conservation organizations including the Morton Arboretum and the Chicago Botanic Garden
- 1992 — The Earth Summit is held in Rio de Janeiro, Brazil. This was the first international convention to develop world-wide policies on biodiversity, sustainable use, and the facilitation of access to genetic resources.
- 1992 — Convention on Biological Diversity
- 1997, 2000 — First and second European Botanic Garden Conferences
- 2000 — International Agenda for Botanic Gardens in Conservation

# New Trends

## Partnerships

### CHICAGO WILDERNESS MEMBERS:

Bird Conservation Network  
 Brookfield Zoo  
 Butterfield Creek Steering Committee  
 The Butterfly Monitoring Network  
 Calumet Ecological Park Association  
 Calumet Environmental Resource Center  
 Campaign for Sensible Growth  
 Campton Historic Agricultural Lands, Inc.  
 Canal Corridor Association  
 Cary Park District  
 Center for Neighborhood Technology  
 Chicago Academy of Sciences  
 Chicago Audubon Society  
 Chicago Botanic Garden  
 Chicago Herpetological Society  
 Chicago Ornithological Society  
 Chicago Park District  
 Chicagoland Bird Observatory  
 Citizens for Conservation  
 City of Chicago, Department of Environment  
 College of DuPage  
 The Conservation Foundation  
 The Conservation Fund  
 Conservation Research Institute  
 Crystal Lake Park District  
 DePaul University, Environmental Science Program  
 Downers Grove Park District  
 Ducks Unlimited-Great Lakes/Atlantic Regional Office  
 DuPage Audubon Society  
 DuPage Birding Club  
 Emily Oaks Nature Center - Skokie Park District  
 Environmental Law and Policy Center of the Midwest  
 The Field Museum  
 Forest Preserve District of Cook County  
 Forest Preserve District of DuPage County  
 Forest Preserve District of Kane County  
 Forest Preserve District of Will County  
 Fox Valley Land Foundation  
 Friends of the Chicago River  
 Friends of the Parks  
 Friends of Ryerson Woods  
 Garden Club of Illinois, Inc.  
 Garfield Park Conservatory Alliance  
 Geneva Park District  
 Glenview Prairie Preservation Project  
 Grand Calumet Task Force  
 The Grove National Historic Landmark  
 Hammond Environmental Education Center  
 Illinois Audubon Society  
 Illinois Audubon Society, Ft. Dearborn Chapter  
 Illinois Department of Natural Resources  
 Illinois Natural History Survey  
 Illinois Nature Preserves Commission  
 Illinois-Indiana Sea Grant College Program  
 Indiana Department of Natural Resources  
 Indiana Dunes Environmental Learning Center  
 Indiana University Northwest  
 Irons Oaks Environmental Learning Center  
 Jurica Nature Museum  
 Kane-DuPage Soil & Water Conservation District

Lake Bluff Open Lands Association  
 Lake County Forest Preserves  
 Lake County Soil & Water Conservation District  
 Lake Co. Stormwater Management Commission  
 Lake Forest Open Lands Association  
 Lake Michigan Federation  
 Liberty Prairie Conservancy  
 Lincoln Park Zoo  
 Long Grove Park District  
 Loyola University of Chicago, College of Arts and Sciences  
 Max McGraw Wildlife Foundation  
 McHenry County Conservation District  
 Metropolitan Water Reclamation District of Greater Chicago  
 Morton Arboretum  
 National Audubon Society  
 Natural Land Institute  
 The Nature Conservancy  
 NISource Environmental Challenge Fund  
 North Cook County Soil & Water Conservation District  
 Northbrook Park District  
 Northeastern Illinois Planning Commission  
 Northeastern Illinois University  
 Northwest Indiana Forum Foundation, Inc.  
 Northwestern Indiana Regional Planning Commission  
 Northwestern University Environmental Council  
 Oakbrook Terrace Park District  
 Openlands Project  
 Palos-Orland Conservation Committee  
 Palos Park Tree Foundation  
 Park District of Highland Park

Prairie Woods Audubon Society  
 Pringle Nature Center  
 River Forest Park District  
 Save the Dunes Conservation Fund  
 Save the Prairie Society  
 Schaumburg Park District  
 John G. Shedd Aquarium  
 Shirley Heinze Environmental Fund  
 Sierra Club, Illinois Chapter  
 St. Charles Park District  
 Sustain, The Environmental Information Group  
 Thom Creek Audubon Society  
 The Trust for Public Land  
 Town Square Condominium Association  
 University of Illinois Extension, Northeast Region  
 University of Illinois at Urbana-Champaign Office of Continuing Studies  
 Urban Resources Partnership  
 US Army Corps of Engineers, Chicago District  
 US Dept. of Energy, Argonne National Laboratory  
 US Dept. of Energy, Fermi Natl Accelerator Lab  
 US Environmental Protection Agency, Region 5  
 US EPA Great Lakes National Program Office  
 USDA Forest Service  
 USDA Natural Resources Conservation Service  
 USDI Fish & Wildlife Service  
 USDI National Park Service  
 Village of Glenview  
 Village of Lincolnshire  
 Village of Riverside  
 Waukegan Harbor Citizens' Advisory Group  
 Wayne Park District  
 The Wetlands Initiative  
 Wheaton Park District  
 Wild Ones Natural Landscapers, Ltd.

Source: Chicago Wilderness, Spring, 2001.

# The Four Legged Stool



## International Agenda for Botanic Gardens in Conservation



# New Trends

## Visitor-friendly Public Gardens

A new sense of community and context creates an awareness of the need for broad participation and of the community's role in supporting and experiencing the institution.

Gardens are now seen as an amenity—a tourist attraction and a vital community institution, like schools, churches or libraries.

The word “visitor-friendly” enters our vocabulary and the diversification of visitor types and the provision of visitor facilities are major institutional concerns.



Source: Cover, *National Geographic*, October, 2000.

# Collecting a New Species—the Visitor

The Experience Economy—Luring & Delighting the Visitor



Susan Tamulevich,  
Collecting a new  
Species: Visitors  
Public Garden,  
Vol. 21, No 2, 2007

Source: *National Geographic*, October, 2000.

Andropogon Associates<sup>Ltd</sup>

# New Trends

## Visitor-friendly Public Gardens

Arboreta and botanical gardens emerged from a period of elitism and isolation and began to take seriously their role as public institutions.



They are now placing new emphasis on their role as good neighbors and in educating the public.



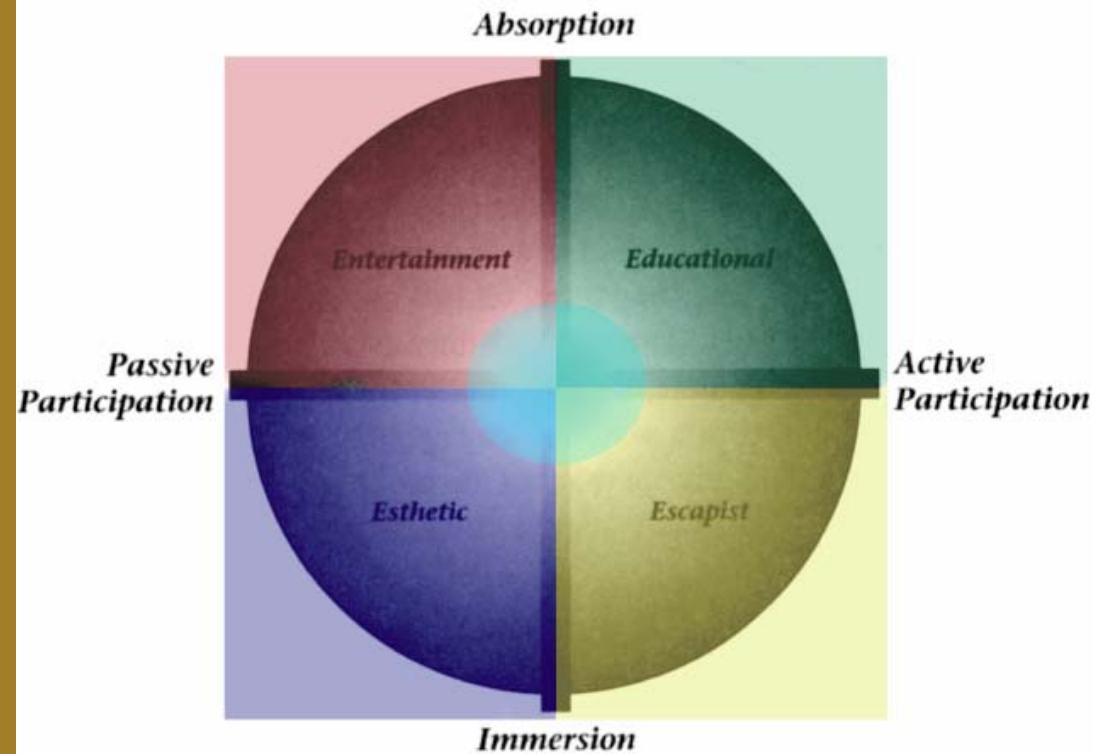
Perspectives of new gardens at The Dallas Arboretum & Botanical Garden

# New Trends

## The Experience Economy—Luring & Delighting the Visitor



Meerkats in the Kalahari Desert  
Source: National geographic



# New Trends

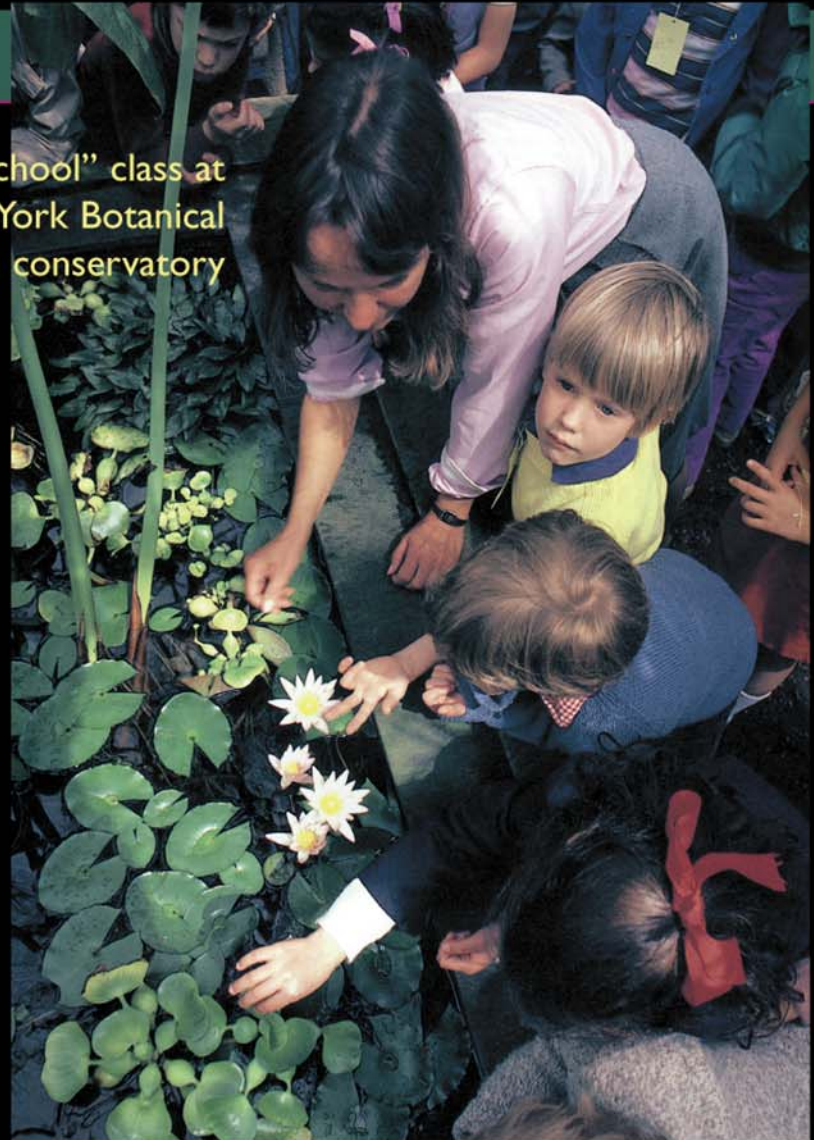
## An Educational Institution— Connecting People to Plants

“The industrial approach to education made teachers the actors and student the passive recipients...the new emerging model ...(makes) students the active players. The active focus will shift from the provider to the user; from educators (teachers) to learners (students) and the educating act will reside increasingly in the active learner rather than the teacher-manager. In the new learning market place...students are all active learners or even more accurately, interactive learners.”

Source: Stan Davis & Jim Botkin, The Monster Under the Bed: Simon & Schuster, NY, 1994.

Andropogon Associates<sup>ltd</sup>

A “Greenschool” class at  
the New York Botanical  
Garden conservatory



Source: The New York Botanical Garden, An Illustrated Chronicle of Plants & People, Ogden Tanner & Adele Auchincloss: Walker Publishing Co., 1991.

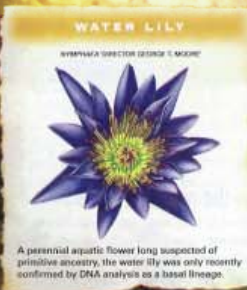
# Learning Versus Education

## Connecting People to Plants

### Mapping a New Route to Old Roots

For centuries botanists have grouped flowering plants largely according to their physical form, or morphology. Paleobotanists, likewise, have relied on the morphology of fossils to determine lines of descent. In recent years, however, molecular biologists have adopted a new approach—comparing the DNA of living plants. Their conclusions, illustrated here, point to three foundational, or basal, lineages:

BOTANICAL ART BY CHANE BRANNONCO;  
MONTAGE BY ALICIA BULLOCK;  
INSET ART BY EDWARD BOULD



**Pollinator Prison**  
Smelling like decaying organic matter, flowers of the Dutchman's-pipe lure phorid flies inside, where they are trapped by guard hairs. Two days later the hairs wither and the flies go free, their bodies dusted with pollen for delivery to another Dutchman's-pipe.



**Basal lineages** Molecular biologists group modern angiosperm lineages based on similarities and contrasts in their DNA sequences. The groups that vary most from the rest do so, according to evolutionary theory, because they've undergone more genetic mutations, which means they must have split off longer ago. Amborellaceae, Nymphaeaceae, and Illiciaceae diverge near the family tree's base (hence basal) and together offer the best picture of the first angiosperms.

**Magnoliids** This group's haphazard tree, the magnolia, boasts an ancient pedigree reaching back more than 100 million years into the fossil record. The magnolia flower produces no nectar but rather a fragrance that attracts beetles for pollination and red seeds that beckon birds for dispersal. Its 220 species grow in temperate and tropical regions of eastern Asia and eastern North and South America. The magnoliids include such familiar plants as safflower, avocado, and black pepper.

**Monocots** Accounting for 65,000 species and a fourth of all angiosperms, monocots are characterized by a single cotyledon, or seed leaf. They are usually herbaceous—lacking wood—and their pollen grains have one pore for germination. The group includes all grasses, such as corn, rice, and wheat; decorative flowers like lilies and orchids; and palm trees, which are effectively giant herbs because their trunks are made of vascular bundles instead of true wood.

**Eudicots** With some 170,000 species, this group comprises by far the largest number of angiosperms. A new classification based on genetic similarities, eudicots include most of the plants formerly called dicots (for their two cotyledons). Their leaves are often broad like those of magnoliids, and many species develop wood like the ancient cone-bearing trees that predate all flowering plants. In fact, DNA evidence suggests that the earliest angiosperms were probably woody.

# Learning Versus Education

## Connecting People to Plants

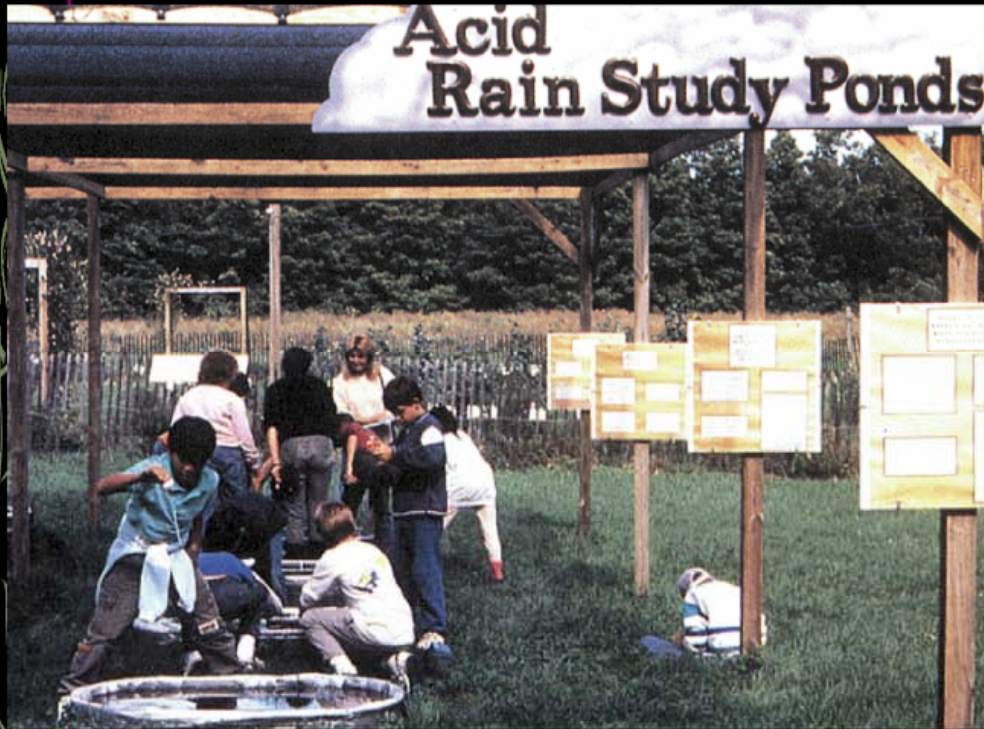
## Fertile Attraction

The vivid mottlecah eucalyptus lures Australian honey possums, one of the two mammal species that live only on nectar & pollen.



# Learning Versus Education

Special facilities such as hands-on green houses and children's gardens



Institute of Ecosystem Studies, Science Garden demonstrates the affects of acid rain on organizms at different pH levels

(Photo: Alan Berkowitz)

Demonstrations of latest horticultural technology—big tree moving, etc.



Big tree moving, rescues a giant American beech from a construction site

# Collaboratively Share Knowledge and Build Community

“A community of practice is necessarily rooted in a body of prior work in which best practice evolves thru shared experience”

Catherine Eberbach,  
“Educators Without Borders”,  
Public Garden, Vol. 22, No 1.,  
2007

# Active Engagement of Visitors

## A Continuum of Involvement

“Visitors are often only voyeurs, Passive viewers of horticultural displays who cannot actively engage with the landscape... they are not challenged to see the landscape in a new way” [ and imagine new roles in creating healthy, beautiful settings for their lives].

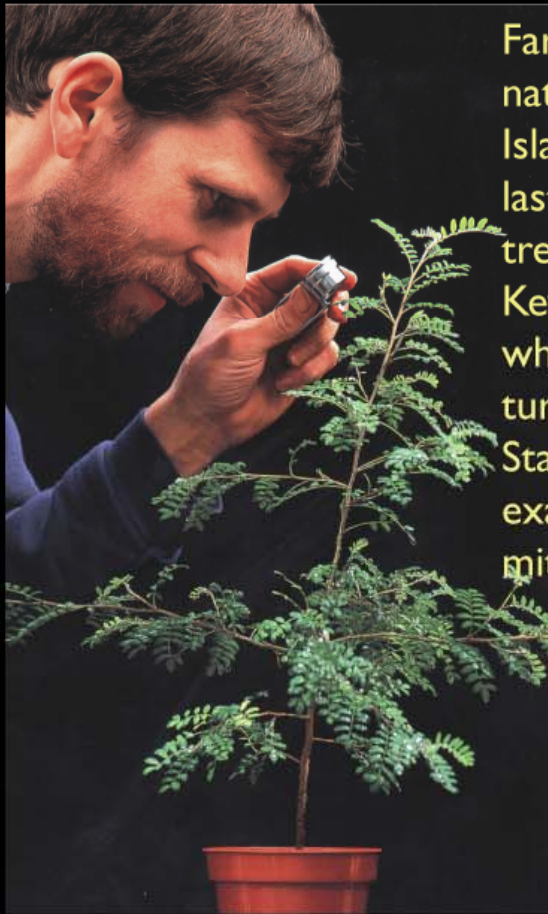
Janet Martinelli, “Education for Sustainability”, Public Garden, Vol. 22, No 1., 2007

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

Great Park, Orange County, CA.,  
Botanic Garden, Designer, Ken  
Smith

# Conservation of Biodiversity

Conservation of individual species—both individual plants and seed banking



Far from its native Easter Island, one of the last toromiro trees survives at Kew Gardens, where horticulturalist Mark Staniforth examines it for mites.

Source: *National Geographic*, Feb, 1999.



At the Royal Botanic Gardens at Kew, in London, botanists have set themselves what seems at first an impossible challenge—collect and store seeds from all the flowering plants of the British Isles. James Wood shelves seeds working in minus 4 degrees F at Kew's seed bank.

# Conservation of Biodiversity

Conservation of open space and natural habitats—both in-situ and ex-situ



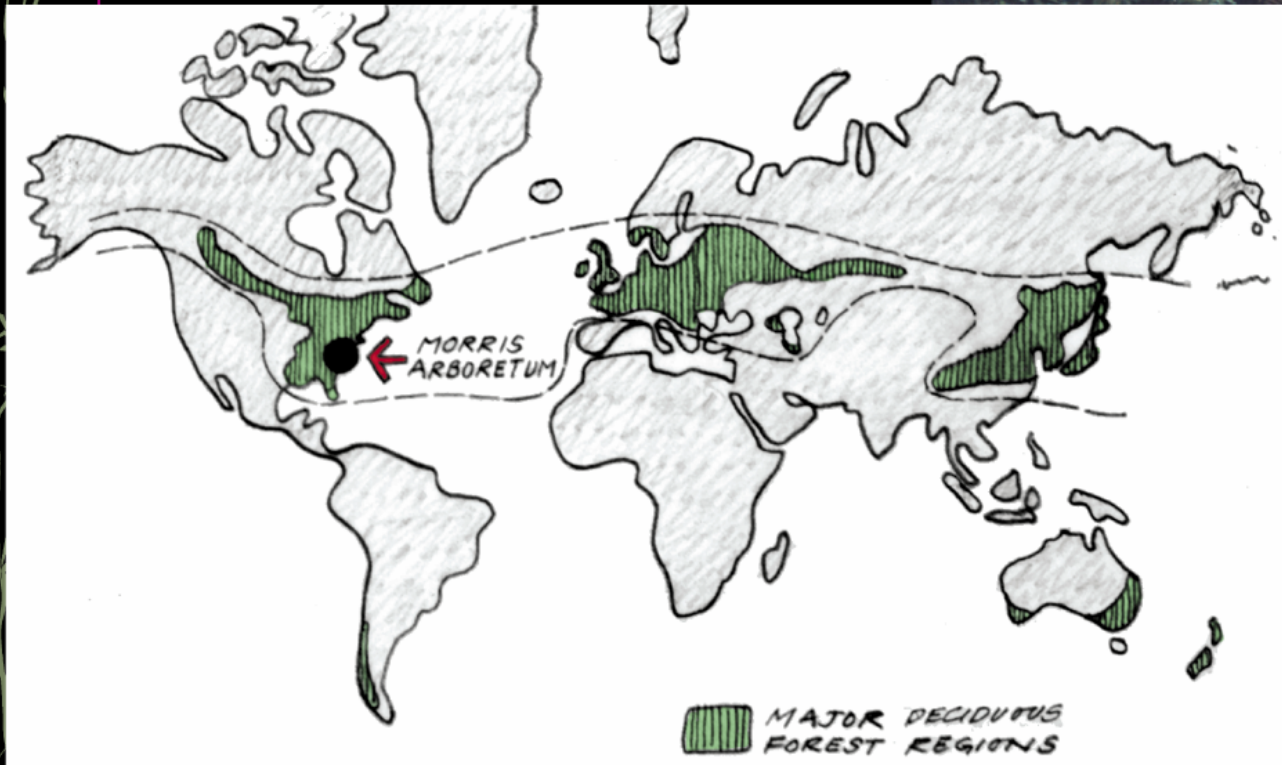
Hemlock forest on Little Mountain, one of Holden Arboretum's extraordinary natural areas



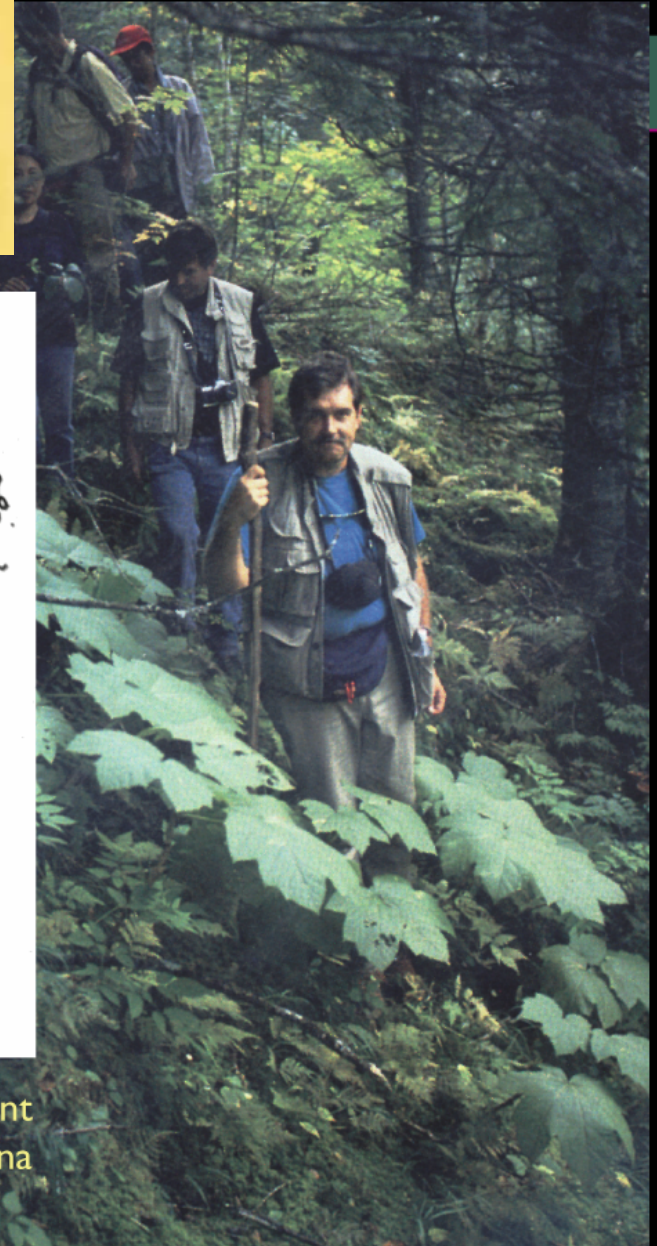
Evolving in isolation, Madagascar's plant life includes a multitude of species found nowhere else. The government of Madagascar is working with international conservation agencies and the Cleveland Botanic Garden to create a sense of pride and ownership in the nation's biodiversity

Source: *National Geographic*, Feb, 1999.

# Plant Exploration (again) for the Identification and Preservation of Biodiversity



A team of researchers from the North American China Plant  
Exploration Consortium (NACPEC), in Changbaishan, China



(Photographer: Paul Meyer)

# Discovering and Describing the Richness of the World (again)



A team of specialists documenting plant and animal specimens where the Andes meet the Amazon

Source: *National Geographic*, February 1999.

# Ethnobotany



QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

# Conservation of Biodiversity

With new plant introductions there is an increasing awareness of the negative consequences of previous plant introductions—invasive exotic plants, animals & insects



Kudzu vines growing at the edge of Wissahickon Park, Philadelphia, PA

# Sustainable Design

## Facilities, Gardens & Infrastructure

Humane buildings, roads, parking lots, etc. that are responsive to regional character, conserve land, water, and vegetation and celebrate plants and an ecological aesthetic



Morris Arboretum porous paving parking lot



Frank Lloyd Wright's Falling Water, in BearRun, PA

Edgar Kaufmann, jr. , Fallingwater; A Frank Lloyd Wright Country House : Aberville Press, 1986

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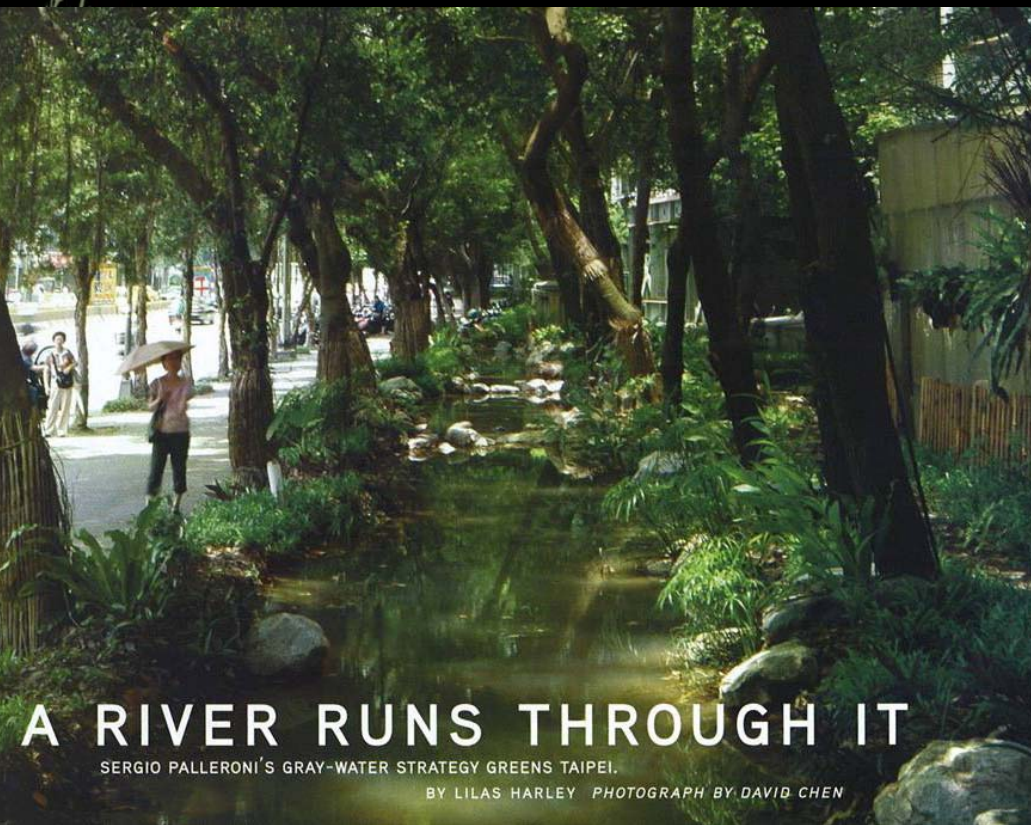


Frank Lloyd Wright's Falling Water, in BearRun, PA

Edgar Kaufmann, jr. , Fallingwater; A Frank Lloyd Wright Country House : Aberville Press, 1986

Andropogon Associates<sup>Ltd</sup>

# Sustainable Design



## A RIVER RUNS THROUGH IT

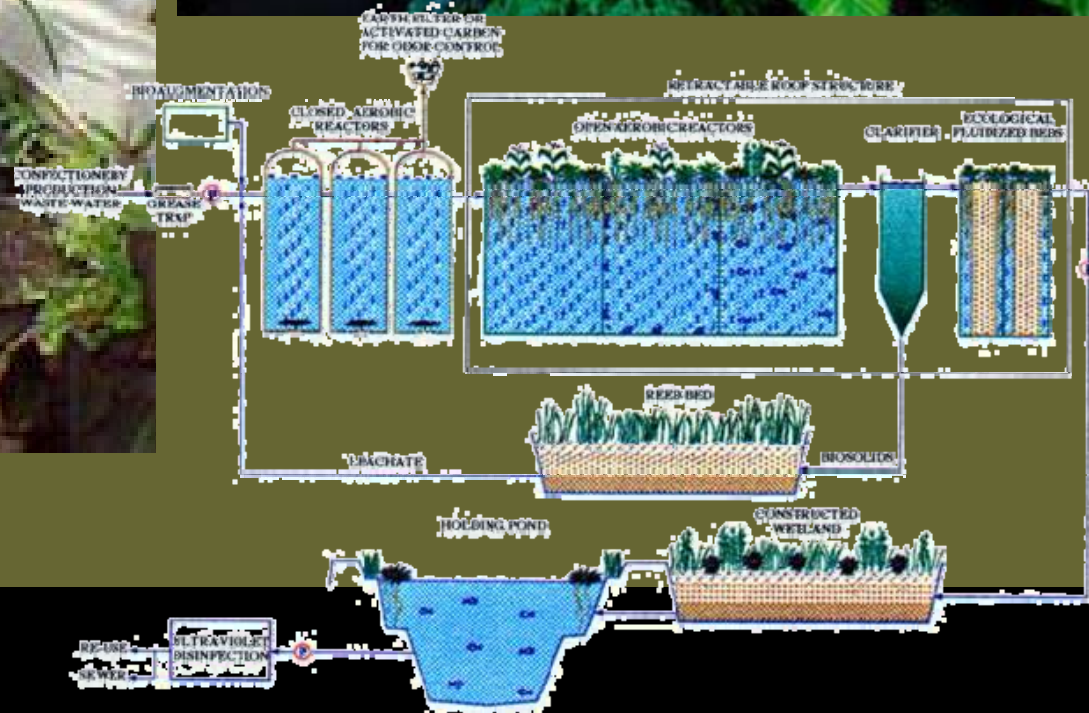
SERGIO PALLERONI'S GRAY-WATER STRATEGY GREENS TAIPEI.

BY LILAS HARLEY PHOTOGRAPH BY DAVID CHEN

Andropogon Associates<sup>ltd</sup>



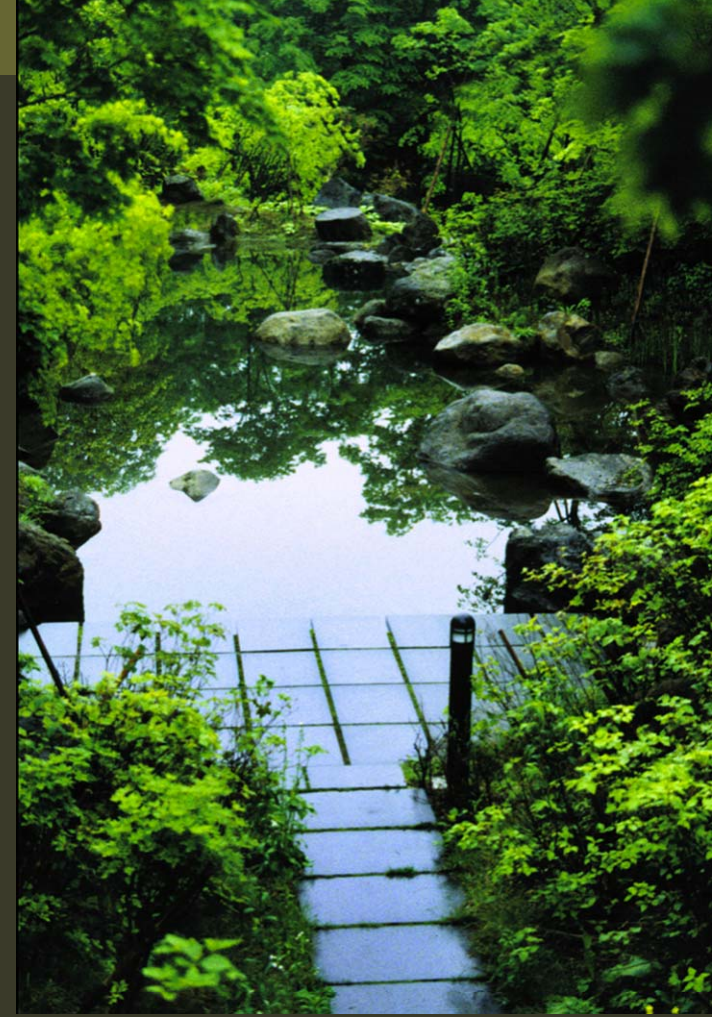
# water treatment—"living machine"



# creating new habitats and destinations with stormwater retention ponds

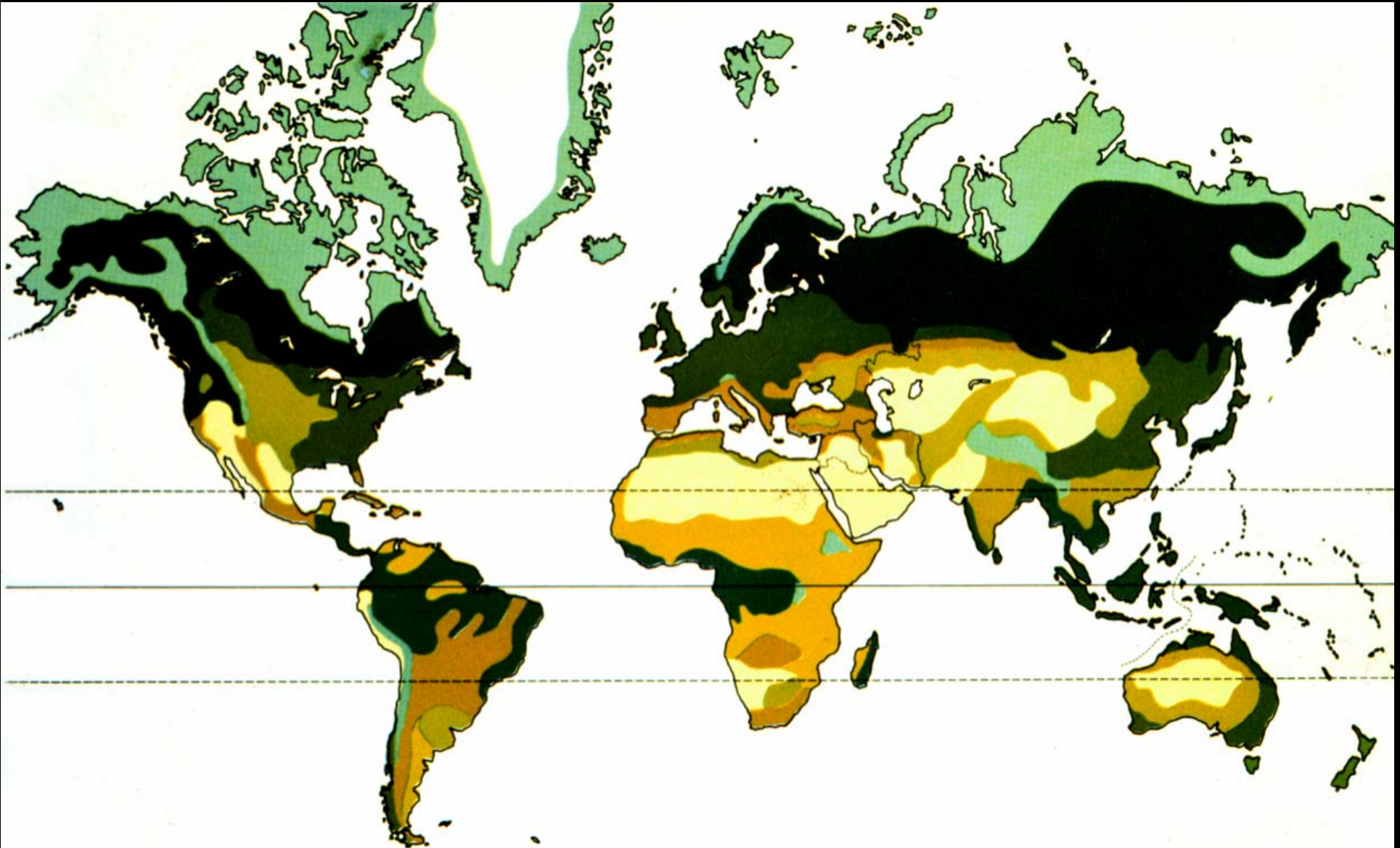


Nikko Kiri Furi Resort  
Tochigi Prefecture | Japan  
with Venturi Assoc.



# Sustainable Design

Expressing your own biome



# Sustainable Design

## Expressing your own local legacy

### Creation of “Curated Natural Habitats”



- Historical Painter collection (19th century)
- Historical Wistar collection (Early 20th century)
- Curated Natural Habitats (21st century)  
Name created by Gerry Laferriere, Horticulturalist, Tyler Arboretum

Plan for Tyler Arboretum showing the horticultural exhibits organized into three major collections.

# Ecological Restoration



“The hand is the cutting edge of the brain.”

*J. Bronowski*

J. Bronowski, The Ascent of Man:  
Little, Brown and Co., 1973.

“The act of doing changes the brain. Restoration and management are performance arts where participation is as important as the results because it changes the participant.”

*Colin Franklin*

(Drawing by: Hannah Coale & Carol Franklin)  
*Roots Exhibit*,  
Morris Arboretum  
of the University of Pennsylvania.

# Sustainable Design

## Biodiversity Conservation

Ecological restoration in arboreta and botanical garden land management, to rehabilitate native plant communities



Controlled savanna burn at Crosby Arboretum, returns fire to a fire-dependent ecosystems, maintaining landscape diversity.



Vertical mulching at Central Park's North Woods provides sites for soil fungi and discourages rogue pedestrian and bicycle traffic.

Andropogon Associates<sup>Ltd</sup>

# Great Expectations

“In the end, we will conserve only what we love, we will love only what we understand, we will understand only what we are taught.”

Baba Dioum,  
Senegalese Conservationist

Children's cards and contributions support the 55,000-acre Children's Eternal Rain Forest, in Costa Rica

Source: *National Geographic*, February, 1999.

Andropogon Associates<sup>Ltd</sup>

